

TOTAL AVULSION OF THE SCALP.¹

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AT about six o'clock A.M., September 23, 1903, Mrs. E. L., aged thirty years, while grinding grain with a belt machine, was caught by her hair (which was not hanging loose) by the perpendicular belt and was hoisted to the low ceiling and then dropped to the floor, leaving the entire scalp, together with all of the left ear, excepting the tragus, the antitragus, and the lobule, and all of the integument and subcutaneous tissue down to the fifth cervical spine behind and to the zygoma and bridge of the nose in front, dangling from the shaft. About half of the left lid and a portion of the right were pulled off with the scalp. A layer of the left temporal muscle was gone, and the cranial bones were denuded of periosteum in several places.

Dr. J. A. Samaniego saw the patient a few minutes after the accident and immediately applied a bichloride-of-mercury dressing. There was scarcely any bleeding and but little apparent shock. I saw her three hours after the accident, but did nothing except to recommend her removal to the hospital, which she entered the same day.

On the second day, twenty-six hours after the injury, shaving grafts (Thiersch) from the patient's thigh were transplanted to the lids and forehead up to the frontal eminences.

September 26, fourth day, grafts from the opposite thigh were placed on both temporal regions, on the mastoid regions, and on the neck for a width of six centimetres (two and one-half inches).

September 28, sixth day, a broad strip around the head was grafted from the husband's thigh. At this time a surface of about 180 square centimetres (seventy square inches), representing approximately half of the denuded area, had been covered with grafts.

¹ Read before the New Mexico Medical Society, May 11, 1904.

September 30, eighth day, a large surface was grafted, partly from the patient's thigh and partly from that of the husband. At the same time a large superficial slough was excised from the vertex.

October 5, thirteenth day, the remainder of the denuded surface was grafted from the thigh of a fourteen-year-old boy. At this time all of the surface was covered with epithelium excepting a few small areas of denuded bone and some spots of granulations between the edges of the grafts.

October 13, twenty-first day, all grafts were looking well, the entire surface where it was denuded being covered with movable skin, excepting the areas of denuded bone. These bone areas were already nearly covered with granulations. Thinking that the moist boric-acid dressings, which had been used up to this time, might cause too much maceration, I dusted the head lightly with boric-acid powder and applied a little carbolated vaseline instead. At the next dressing, two days later, I found that the vaseline dressing was macerating the new skin, so discarded it and applied a physiologic salt solution dressing. On the second day after this there was pus on the surface of the grafts, the amount being much larger on the grafts taken from the man and boy than on the ones autotransplanted. From this time on to the fortieth day from the time of the injury the grafts from the man and boy gradually dissolved off, despite all treatment applied. It was a molecular disintegration from the edges of the grafts. All of the autotransplanted grafts remained intact, and it is noteworthy that several of them formed islands, around which grafts from the other persons had been placed.

November 5, forty-third day, a large area was grafted from the patient's leg, and on the forty-eighth day the grafting was finished from her arm.

Sixty days after the injury the entire area which had been denuded was covered with movable skin, with the exception of three spots, the largest three centimetres in diameter, where a little of the bone was still bare. These soon cicatrized. (Figs. 1 and 2.)

The highest temperature (month) of the patient during treatment was 101° F., and the highest pulse-rate 116, on the second day. The temperature ranged from 99° to 100° F. up to the thirtieth day, after which it remained normal.

The above history tells only half the tale. Having gotten a denuded cranium completely covered with new skin, the next part of the battle is to prevent loss of considerable portions of the new skin from pressure or from microbial invasion. The pressure of the dressings across the forehead while the vertex was still under treatment, although the dressings were elastic and were carefully applied, caused a slight exfoliation of the stratum corneum, and microbial action carried the process through the still feebly resistant skin; but it healed readily, leaving a movable cicatrix.

After complete healing of the entire surface grafted, although the head was kept covered with a layer of absorbent cotton, held on with a muslin skull-cap, the stratum corneum would give way here and there, small crusts would form, and in a very short time thin seropus would lift the corneum and lucidum from the rete over a large area. Close attention prevented destruction of the deep layers so extensively as to require regrafting. If vaseline or lanolin were applied too freely the stratum corneum also gave way. Then, too, it was necessary to avoid the use of any but the mildest antiseptics, either in the form of powder or otherwise, when ulceration occurred. Since May there has been no further trouble. The patient wears a wig of her own hair. (Fig. 3.)

None but the Thiersch grafts were used in this case, because I considered this to be the best form of graft for the purpose. The grafts were about two and one-half centimetres (one inch) wide and from five to twenty centimetres (two to eight inches) long. For the skull I made the grafts rather thick, including, besides the stratum corneum, the stratum lucidum and the stratum Malpighii or rete mucosum, with the tips of the papillæ of the chorium, also a considerable portion of the chorium proper. The edges of the grafts should overlap slightly.

The surface from which the grafts are taken is shaved, scrubbed with alcohol, and then anaesthetized by the application of a mixture of ice and salt. Occasionally, the skin was frozen stiff, but not intentionally so, as a sufficient degree



FIG. 1.—Result from skin-grafting in case of avulsion of scalp. (Lateral view.)



FIG. 2.—Result from skin-grafting in case of avulsion of scalp. (Anterior view.)



FIG. 3.—Final result in case of avulsion of scalp; cicatrized area covered by wig.

of anaesthesia can be obtained short of freezing. The freezing seemed to make no difference in the vitality of the grafts, as none were lost primarily. The same hollow-ground razor used for shaving was, after cleansing with an alcohol sponge, employed to cut the grafts. No special knife is needed for this purpose. If the assistant holds the skin taut with a hand laid flat on each side of the limb, the graft can be cut in less time than it takes to write this sentence. The skin is wiped dry with a sterile gauze sponge, the razor dipped in physiologic salt solution, and the graft cut with a sawing motion.

Of course, grafts are always placed on an aseptic surface, either freshly denuded or granulating. Not many years since, it was thought that skin-grafts would grow only on a granulating surface. It is now well known that they will grow readily on raw aponeurotic surface and on raw bone.

In this case, as indicated in the clinical history, only grafts from the patient herself produced permanent skin, although none of the heterogeneous grafts were lost primarily. Bivings, quoted below, had a similar experience in his case. We must, then, conclude that heterogeneous grafting on the vault of the cranium should be avoided.

Complete avulsion of the scalp is sometimes attended with fatal haemorrhage and shock, and the next danger is from infection, often resulting in death from sinusitis, meningitis, cerebritis, erysipelas, or long-continued suppuration. These conditions are, as a rule, avoidable.

I find nothing of account on the subject of avulsion of the scalp in any of the standard text- or reference-books. The only article in a goodly line of current literature at my disposal is one by W. Troy Bivings, of New York, entitled, "Avulsion of the Scalp, With Report of a Case" (*Philadelphia Medical Journal*, Vol. ix, p. 1020, June 7, 1902).

A noteworthy feature in all of the cases reported up to the time of Bivings's publication is the length of time required for the treatment. In one of Gussenbauer's cases, it required twenty months to effect complete healing, owing to the continual breaking down of the cicatrices. In this case 340 pieces

of skin were grafted, 270 of which healed in place. In another of his cases of complete avulsion, in a girl of sixteen years, death resulted a few days less than a year after the injury. Abbe, of New York, reported a case in which 12,000 grafts were planted in four years. In the winter of 1892-3, the late F. C. Schaefer exhibited a case before the Chicago Medical Society which, to the best of my recollection, had been under treatment for at least one or two years and was not yet healed. In the case reported by Bivings, in which approximately half the scalp was avulsed, healing was complete in about eighty days from the time of injury,—marking, apparently, a distinct advance in the management of such cases. The case here reported, involving the entire scalp, was completely healed in seventy to seventy-five days, and this time could have been reduced by about half through avoiding the use of heterogeneous grafts. Practically, the entire head was covered with new skin within three weeks after the injury, but the heterogeneous part of it disintegrated during the next three weeks.

As a matter of historic interest, I will quote from Bivings's article the following:

"In consulting the literature on this subject, I have been fortunate enough to discover an article entitled, 'Remarks on the Management of Scalped Head,' by the late Felix Robertson, M.D., which was published in the *Philadelphia Medical and Physical Journal* years ago, from which I quote the following:

"In the year 1777, Fred Calvit was badly wounded and nearly the whole of his head skinned. Dr. Vance of the Long Islands, of Holsteins, was sent for and stayed several days with him. The skull bone was quite rotted and began to turn black in places, and, as Dr. Vance was about to leave Calvit, he directed me (as I was stationed in the same fort with him) to bore his skull as it got black, and he bored a few holes himself to show the manner of doing it. I have found that a flat-pointed, straight (shoemaker's) awl is the best instrument to bore with, as the skull is thick and somewhat difficult to penetrate. When the awl is nearly through, the instrument should be more lightly borne upon. The time to quit boring is when a reddish fluid appears on the point of the awl. I bore at first about one inch apart, and as the flesh appeared to rise in these holes I bored a number more between the first. The flesh will rise considerably above the skull and sometimes raise a black scale from it, about the thickness of common writing-paper. It is well to assist in getting off the scales of bone with the awl. These scales are often as large as a dollar, sometimes

even twice as large. It will take at most two weeks from the time of boring for it to scale. When the scale is taken off at the proper time, all beneath it will appear flesh, like what we call proud flesh, as if there was no bone under it. The scalped head cures very slowly, and if this kind of flesh rises in places higher than common, touch it with blue-stone water and dress it once or twice a day, putting a coat of lint over it every time you dress it, with a narrow plate of ointment. It skins over remarkably slow.'

"In 1768, I saw a young man in South Carolina, who had been scalped eight years before that time, and about twice the size of a dollar of the bone of his head was perfectly bare, dry, and black. I am persuaded that, had his skull even then been bored, he might have recovered of the wound, which put an end to his life about a year after I saw him. The naked portion of the bone rotted or mortified and exposed the substance of his brain, a very considerable quantity of which issued out at the opening at his death."

Bivings reports that after careful and systematic research he was unable to find more than thirteen cases of scalp avulsion recorded, and several of these were incomplete in character, in so far as the scalp was only partially destroyed. "Of the thirteen cases, one case was reported by Hyrtl, two by Gussenbauer, two by Robertson, one by Sutliff, one by Warren (J. C.), one by Warren (J. M.), one by Lueas, one by Gerok (M.), one by Abbe, one by Sick, one case (under treatment) in Gouverneur Hospital."

Bivings's case in brief. Girl aged fourteen years, white. Injury, October 24, complete avulsion of the scalp, together with the periosteum, covering both the parietal and a part of the occipital bones. Unconscious when first seen; marked concussion; some hemorrhage from branches of temporal, posterior, auricular, and occipital arteries. Wound surface dirty and greasy. Thorough cleansing, bichloride applied, then a wet dressing of aluminum acetate; ice helmet. Bones exfoliated in about two weeks. The latter part of November a bilateral bronchopneumonia had developed from pertussis, which she had at time of injury; patient very ill for five days; temperature, 105.5° F. Three skin-grafting operations, the last one on January 1. First grafting from father's thigh, grafts one by three inches in size. They were Thiersch grafts and the majority of them grew. Second operation was a combination of the Krause and Reverdin methods; skin taken from thighs of eighteen-year-old boy; none grew. Next tried egg skin and frog skin, and Lusk's method; all failed. Patient then had bilateral mumps, followed by membranous colitis; very ill. Third operation, January 1; Thiersch grafts from patient's thighs, flabby granulations having been curetted away four days previously. Two weeks later head entirely covered with skin.